



TRANSNUCLEAR, INC.

October 23, 2000

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Mr. Ronald D. Hauber
Director for Non-proliferation, Exports and Multilateral Relations
Office of International Programs
Mail Station 04E9
U.S. Nuclear Regulatory Commission
Washington, DC 30555

SUBJECT: TNY REF: MIS 545
APPLICATION TO USNRC FOR LICENSE TO EXPORT
NUCLEAR MATERIAL (10 CFR 110)

Dear Mr. Hauber:

In accordance with 10 CFR 110, "Export and Import of Nuclear Equipment and Material", Subpart C, 10 CFR 110.31 "Application for a specific license", and 10 CFR 110.32, "Information required in an application for a specific license/NRC Form 7", Transnuclear, Inc., on behalf of Atomic Energy of Canada, Limited (AECL) requests the U.S. Nuclear Regulatory Commission to issue a USNRC specific license to export, shipments over a one year period, highly enriched uranium (HEU) for the production of targets that will be irradiated by AECL to produce radioisotopes for medical applications.

Enclosed is a completed NRC Form 7, "Application For License To Export Nuclear Material And Equipment", a supplement to Item 25 and a check issued to US Nuclear Regulatory Commission for \$9,300 for the licensing fee.

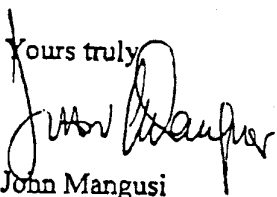
In support of the application, we are also enclosing a "Checklist For Use in Review of Request for HEU to Determine Technical and Economic Justification". Because portions of the checklist contain commercial information and confidential information regarding inventories of HEU, AECL and Transnuclear have prepared confidential and U.S. Nuclear Regulatory Commission public

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Page 2 of 2

versions of the checklist. The public version is enclosed as Attachment A. The confidential portions are enclosed at Attachment B. The confidential version of the checklist is marked "Protected-Commercial". An affidavit, executed by a senior AECL official, is attached to the confidential version of the checklist. For the reasons specified in the affidavit, Transnuclear and AECL request that the confidential version of the checklist (Attachment B) be maintained by the NRC in confidence pursuant to 10 CFR 2.790 and 9.714.

Your expedited review and issuance of the export license is appreciated. If you have any questions, please call me.

Yours truly,


John Mangusi
General Manager - Operations
Transnuclear, Inc.

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**SUPPLEMENT TO ITEM NUMBER 25 OF NRC FORM 7, SUBMITTED BY
TRANSNUCLEAR INC. ON BEHALF OF AECL, REGARDING APPLICATION TO
EXPORT APPROXIMATELY 10 KG OF HIGHLY ENRICHED URANIUM TO
PRODUCE TARGETS TO BE IRRADIATED IN THE NRU REACTOR, FOR THE
PRODUCTION OF MEDICAL ISOTOPES, INCLUDING MOLYBDENUM 99**

I. PURPOSE OF EXPORT

For the reasons discussed in section II below, the proposed export to Canada of 10 kilograms of highly enriched uranium (HEU) in the form of uranium metal is needed to ensure the uninterrupted production of radioisotopes for medical purposes, including molybdenum 99 (Mo-99). Pursuant to commercial arrangements between AECL and MDS Nordion, AECL will use the HEU that is the subject of this export license application to produce targets for irradiation in the NRU reactor. After irradiation, those targets will be processed at a facility at AECL's Chalk River site, to extract Mo-99 and other radioisotopes for use in the treatment of seriously ill patients in Canada and the United States.

AECL's request to export 10 kg of HEU is based on the quantity of HEU that was necessary in recent years to produce sufficient HEU targets for irradiation in the NRU reactor, to meet current requirements, by MDS Nordion's customers, for medical isotopes, in particular Mo-99. The HEU metal would be received, over a one-year license term, in two shipments of 5 kg each.

To ensure the uninterrupted production of medical isotopes at the NRU reactor and its associated processing facility, an initial shipment of 5 kg of HEU to AECL's Chalk River site must occur by the end of March 2001, in order to begin the manufacture of targets in sufficient time to ensure that they will be available for use in the NRU reactor by July 2001, when AECL anticipates that the current inventory of targets for the NRU will be exhausted.

II. NEED FOR AN ADDITIONAL QUANTITY OF HEU

The requested export license is necessary because AECL has encountered a delay in operating the MAPLE reactors and associated New Processing Facility (NPF). The delay results from a technical problem with the reactor shut-off rod system and deficiencies in tubing installations in the reactors and NPF. Consequently, AECL must continue the supply of isotopes from the NRU reactor longer than had been anticipated.

As AECL has previously indicated to the NRC, it was anticipated that the supply of medical isotopes from the NRU reactor could not continue beyond May 2001, because of regulatory limitations on the storage capacity of AECL's Fissile Solution Storage Tank (FISST). The above-mentioned delay in operating the MAPLE reactors and NPF, however, forced AECL to renew its efforts to identify solutions to the current limitation on the capacity of the FISST. As a result, AECL has identified potential solutions, including cementation of waste as well as authorization by Canadian regulatory authorities of an increase in the permissible limit of uranium concentration in the FISST.

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Because of the above-mentioned delay in operating the MAPLE reactors and NPF, AECL will need to procure more HEU metal to produce targets for the NRU reactor than was anticipated. Export license XSNM 03012, granted by the NRC on June 8, 1998, authorized the export to Canada of 26.738 kg, in the form of metal, for fabrication into targets for the NRU reactor. This export license was obtained by AECL to ensure that sufficient target material for the NRU would be available, in the event that the Dounreay facility in Scotland was unable to process target fabrication scraps containing approximately 24 kg of HEU metal, sent by AECL to Dounreay, and return the recovered HEU to AECL by the time it was needed to produce targets for the NRU reactor.

To date, the Dounreay facility has been unable to process any of AECL's fabrication scraps. AECL was recently advised that Dounreay is unlikely to restart on a schedule that would allow the processing of these fabrication scraps and the return of the recovered HEU to Canada by the time it is needed to produce targets for the NRU reactor.

Because of the unavailability of the HEU that was to have been obtained as a result of processing AECL's fabrication scraps at Dounreay, AECL has used the entire quantity of HEU whose export was authorized under XSNM 03012, to produce targets for the NRU reactor. AECL currently has enough HEU targets to continue isotope production in the NRU reactor until about July 2001.

III. RELATIONSHIP OF REQUESTED EXPORT LICENSE TO XSNM 03060, AUTHORIZING EXPORT OF TARGETS, CONTAINING HEU IN THE FORM OF UO_2 , FOR USE IN THE MAPLE REACTORS

In July 1999, the Commission approved the Staff's issuance of XSNM 03060, authorizing Transnuclear, on behalf of AECL, to export a total of 130 kg of HEU, in the form of UO_2 contained in fabricated targets, for irradiation in the MAPLE reactors. Following irradiation, the targets are to be processed at the NPF to extract Mo-99, for use in the diagnosis and treatment of patients who have serious illnesses.

The history, purpose and current status of the MAPLE reactors and the NPF are described in detail in reports that MDS Nordion submitted to the Commission earlier this year. These reports contain a detailed explanation of the status of efforts that are actively underway to develop LEU targets that may be irradiated in the MAPLE reactors and processed in the NPF, consistent with operational constraints and Canadian regulatory requirements.

IV. HEU TARGETS FOR THE MAPLE REACTORS AND NEW PROCESSING FACILITY

Before applying for this export license, AECL evaluated the possibility that some of the HEU whose export for use in the MAPLE reactors is authorized by XSNM 03060 could be used to produce additional targets for the NRU reactor, pursuant to an appropriate export license amendment. However, the HEU UO_2 targets whose export is authorized by XSNM 03060 are

designed specifically for the MAPLE reactors and NPF. The isotope facilities currently in operation are designed to process uranium-aluminum alloy targets irradiated in the NRU reactor. Moreover, a license amendment to permit an export of a different form of material and a different end use, for 10 kg of the remaining authorized quantity of HEU, is not a viable means of obtaining targets for the NRU reactor since all of the HEU UO_2 targets whose export is authorized by XSNM 03060 are likely to be needed for the MAPLE reactors, as explained below.

A delay in operating the MAPLE reactors and NPF will not reduce the quantity of HEU targets that must be irradiated and processed in those facilities, pending completion of the ongoing program to shift those facilities from HEU to LEU targets. Some aspects of the HEU to LEU conversion program for the MAPLE reactors and NPF may be effectively pursued without having access to targets irradiated in the MAPLE reactors. However, the performance of such targets in the MAPLE reactors can only be assessed through experience with those reactors once they become fully operational. Likewise, because the operation of the NRU reactor differs significantly from the MAPLE reactors, the performance of the NPF cannot be assessed until targets irradiated in the MAPLE reactors are available for processing on a test basis. Consequently, an unavoidable consequence of a delay in operation of the MAPLE reactors is a corresponding extension of the time that will be required to complete the HEU to LEU conversion program.

In summary, since the number of HEU targets needed for the MAPLE reactor will not be reduced as a result of a delay in placing the MAPLE reactors and NPF into operation, it is not feasible for AECL to seek an amendment to XSNM 03060, allowing AECL to use 10 kg of the total quantity of HEU whose export is authorized by that license for a newly specified end use in the NRU reactor.

V. ANNUAL REVIEW BY THE NRC OF THE TOTAL QUANTITY OF HEU NEEDED BY AECL IN CONNECTION WITH MEDICAL RADIOISOTOPE PRODUCTION AT THE NRU AND MAPLE FACILITIES

On July 10, 2000, the Commission conducted a public meeting on issues related to the export of HEU targets to Canada, for irradiation in the MAPLE reactors to produce radioisotopes for medical uses. In a presentation to the Commission and in responses to Commissioners' questions, representatives of AECL and MDS Nordion reviewed their progress and plans regarding conversion of the MAPLE reactors and NPF to operate with LEU rather than HEU targets and explained their need for the full remaining authorized quantity of HEU to produce targets for those reactors. Following this meeting, a Staff Requirements Memorandum (SRM) issued by the Secretariat expressed the Commission's conclusion that the "licensee has made significant progress over the past year in identifying, analyzing and resolving issues relevant to the conversion of the MAPLE reactors and NPF to LEU targets, particularly within the period immediately preceding this briefing."

During its next annual review in connection with XSNM 03060, in mid 2001, the Commission will have an opportunity to consider the reports of the Applicants, the Executive Branch and Argonne National Laboratory (ANL) concerning the status of the LEU conversion program for

the MAPLE reactors and NPF, and the then-current inventories of HEU available to produce targets for the MAPLE reactors and the NRU reactor. Based upon such reports, the Commission will be able to evaluate the extent to which continued medical radioisotope production in the NRU reactor will be needed, pending full operation of the MAPLE reactors, and the extent to which HEU metal exported to Canada to produce targets for the NRU reactor could be shifted to the production of targets for the MAPLE reactors.

If the above-mentioned technical issues preventing operation of the MAPLE reactors are resolved more rapidly than is currently anticipated, some portion of the HEU that is the subject of this application may not be needed to produce targets for the NRU reactor. In that event, the Applicants will not use the license to export any quantities of HEU that are no longer needed.

VI. COMPLIANCE WITH THE NRC'S REGULATIONS IMPLEMENTING THE SCHUMER AMENDMENT

AECL and Transnuclear submit that the NRC's regulations implementing Section 134 of the Atomic Energy Act, as amended (the Schumer Amendment) will be satisfied if the requested export license is granted for a one-year term. An alternative low enriched uranium (LEU) target that can be used in the NRU reactor is not currently available and cannot reasonably be expected to become available for use within the one-year term that is requested for this export license.

The NRC's requirements concerning the Schumer Amendment, incorporated in 10 CFR §110.42(a)(9), and a September 1997 exchange of diplomatic notes between the U.S. and Canadian Governments recognize that in order to be available for use within the meaning of the Schumer Amendment, an LEU target must have been "qualified by the relevant authorities". To date, the relevant authorities in the United States and Canada have not qualified such LEU targets for use in the NRU reactor. Moreover, since AECL and MDS Nordion reasonably focused their efforts on constructing the new MAPLE reactors to replace the 43-year old NRU and are developing LEU targets for the MAPLE reactors and associated NPF, there is not sufficient time to develop an LEU target for use in the NRU reactor during the approximately one additional year of operation, beginning in July 2001, that is now anticipated.

VII. CONCLUSION

In summary, the requested export license is needed to ensure the continued availability of a stable and reliable supply of radioisotopes to serve the needs of medical patients in Canada, the United States and elsewhere. The requested 10 kg of HEU metal is needed in order to produce a sufficient number of targets for irradiation in the NRU during a period in which technical

problems will probably continue to prevent operation of the MAPLE reactors and associated NPF. Under these circumstances, the Applicants submit that issuance of this export license is consistent with the Schumer Amendment and all applicable NRC export criteria.



Jean-Pierre Labrie
General Manager, Research and Isotope Reactor Business
Atomic Energy of Canada Limited (AECL)
2000 October 20

Attachment A

CHECKLIST FOR USE IN REVIEW OF REQUESTS FOR HEU TO
DETERMINE TECHNICAL AND ECONOMIC JUSTIFICATION

1. Name of reactor and facility.

The HEU is being requested for the NRU Reactor at AECL's Chalk River Laboratories (CRL) to be used for medical isotope production. The HEU being requested for export will be in the form of metal.

There is no reactor fuel included in this request.

Note 1

Medical isotopes are currently produced in AECL's NRU Reactor located at CRL. However, medical isotopes are scheduled to be produced in the MAPLE 1 and MAPLE 2 Reactors now being built at CRL as part of the MDS Nordion Medical Isotopes Reactors (MMIR) Project. Isotopes will be produced in the MAPLE 1 and MAPLE 2 Reactors by irradiating HEU dioxide targets. In addition to the MAPLE Reactors, AECL is also building a New Processing Facility (NPF) where targets, irradiated in the MAPLE Reactors, will be processed to extract medical isotopes. Production of isotopes in the NRU reactor will end in year 2001 or when the MAPLE Reactors and NPF are in service.

2. Location

Atomic Energy of Canada Limited
Chalk River Laboratories
Chalk River, Ontario
CANADA, KOJ 1JO

3. Quantity of Uranium requested

2001 10.0 kg HEU (in the form of metal)

4. Enrichment in the Isotope U-235

93.15 wt%

5. Quantity of U-235

2001 9.3 kg U-235

6. Type of Fuel Assembly and Form of Uranium

12 element U₃Si-Al Fuel Assembly

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Note 2

The NRU fuel is 61.4 % U_3Si in U_3Si-Al , 96.04 U in U_3Si and 19.75 wt% U-235.

7. Current Reactor Power Level (MW th)

130 MW

8. Duty Factor, Average Burnup

NRU Duty Factor about 75%

Average Driver Fuel Burnup of all Fuel in Core about 170 MWD

9(a) Current Core Loading (kg U-235)

42.7 kg U-235 (LEU)

0.5 kg U-235 (HEU targets for medical isotope production)

(b) Amount of Fuel Per Assembly (kg U-235)

0.486 kg

(c) Number of Assemblies in Core

90 (LEU)

(d) Average Core Life

Average exit burnup about 305 MWD; on-power re-fueling (avg. 9 rods/month). See Note 3 below.

Note 3

This average fuel rod usage does not include any contingencies.

The NRU Reactor annual fuel rod usage is 108 rods for an average of 9 rods/month.

A contingency of an extra 17 rods/year is required to counter fluctuations in neutron contribution from isotope rods, experimental rods etc.

(e) Active Core Dimensions

3.1 m diameter x 3.1 m in height

(f) Neutron Flux

Average mean neutron flux in the core:

thermal - $1.4 \times 10^{14} \text{ ncm}^{-2}\text{s}^{-1}$

fast - $4 \times 10^{13} \text{ ncm}^{-2}\text{s}^{-1}$

10. Annual Fuel Usage, (kg U-235)
 11. Annual Spare Fuel Requirement (kg U-235)
 12. Plans to Increase or Decrease Reactor Power Level
 13. Estimated Annual Supply of Current Request
 14. Required Manufacturer's Working Stock, if any, included in this request.
 15. Fabrication Loss, if any, included in this request (kg U-235)
 16. Name of Converter and Fabricator of Fuel
- The alloying of the uranium metal and the fuel fabrication of the isotope production targets are done at Atomic Energy of Canada Limited, Chalk River Laboratories.

17. Location

See Section 16.

18. Inventory

19. Date at which current inventory, including 18 (a, b, c) will be expended.

HEU metal - 2001 July (See Note 7)

HEU dioxide - Not Applicable (the date at which the current inventory is expended depends on the date at which the MAPLE 1 and 2 Reactors and the NPF begin producing medical isotopes.

Note 7

This date is based on the available inventory of materials covered under Sections 18 (b) and (c) only. As described in Note 6, the current scrap inventory (Section 18 (a)) must be recovered before it can be used for target fabrication.

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20. Date current request fuel will be needed at reactor.

2001 June

21. Date current requested will be needed by converter and fabricator.

2001 March

- 22(a) Time taken for shipment from USA to Converter/Fabricator

Category I (> 5 kg U-235) Shipments of metal from the U.S.A to CRL, Canada, would be completed in one day and would be via military airlift.

Category II (< 5 kg U-235) Shipments would be over-night delivery completed in < 24 hours.

- (b) Lead time for ordering in U.S.A.

Normally eight months (Does not include shipping/export license acquisition)

23. Date at which current requested fuel will be expended, i.e. when a further HEU supply will be needed at reactor

2002 June

24. Dates at which reactor could be converted to 45% fuel; to 20% fuel,. Including time required for licensing procedures:

The Government of the United States and the Government of Canada have agreed that whenever a low enriched uranium (LEU) target has been qualified by the relevant authorities and does not result in a large percentage increase in the total cost of operating a reactor, including necessary associated equipment, for the production of medical isotopes, such an alternative LEU target will be used in that reactor in lieu of a high enriched uranium (HEU) target after required equipment has been installed and the necessary licenses have been obtained.

The NRU Reactor uses LEU driver fuel (19.75 wt% U-235).

25. History and Dates of previous HEU supplies by the U.S.A.

See Attachment 2.

26. Amount of Fuel of US origin previously consumed during operation of reactor.

All HEU consumed by AECL research reactors and the medical isotope programs to date has been of U.S. origin.

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27.
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28. Status of cooperation between reactor operator and Argonne National Laboratory in Reduced Enrichment Program (RERTR) and Status of Agreement between Reactor Operator and ANL to reduce enrichment.

The Canadian commercial entities involved in the production of molybdenum 99, MDS Nordion and AECL, are aware of the requirements of Section 134 of the Atomic Energy Act of 1954, as amended (AEA), commonly referred to as the Schumer Amendment, and have confirmed they are prepared to provide on a commercial basis, to the extent of their capabilities, information and services to the United States Government in its LEU target research and development efforts. The status of this cooperation was comprehensively addressed in two reports that Applicants submitted to the Commission earlier this year.

29. Status of cooperation between reactor operator and IAEA reduced enrichment program.

AECL/CRL was represented on an IAEA technical committee that prepared a guidebook for "Safety and Licensing Issues of Research Reactor Core Conversion from HEU to LEU".

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